

# THE EUCALYPTS OF PARRAMATTA, WITH DESCRIPTION OF A NEW SPECIES.

BY CUTHBERT HALL, M.D., CH.M.

(Plates lx.-lxi.)

In no genus of plants does the distribution of the species appear to depend more on physical factors than is the case with the Eucalypts. The natural barrier of the dry, hot, barren region of Central Australia divides the genus into two main groups, the Eastern and Western, very few species being common to both; while the Main Dividing Range breaks up the Eastern group into three subgroups, the coastal, the highland, and the inland. Those that we are concerned with, belong to the coastal, though several of them are also found on the highlands and inland.

The Parramatta District embraces an area  $14 \times 18$  miles, and in this no less than twenty-four Eucalypts occur, and possibly there may be an odd tree or two of several other species, which are to be found in places just outside this area. But these twenty-four species are not regularly and evenly scattered around, but follow definite lines of distribution, depending mainly on soil-formation, but also other physical factors, such as prevailing winds, elevation, humidity of atmosphere, drainage, proximity to a stream, and distance from the sea-coast. Certain species are found over the whole area, notably *E. eugenioides* and *E. resinifera*, while others are strictly localised. The seeds of these must be constantly being carried on to adjacent localities, yet they do not even seem to germinate, or, if seedlings spring up, they perish at an early age, or are crowded out by other species. For instance, I have never found *E. longifolia* growing in the north-eastern quadrant of this area, yet it is very common on the deep clay of the southern side. Again, it is very common to find certain species, which are not at all closely related botanically, to be constantly associated with one another. Thus *E. hemiphloia*, *E. crebra*, and *E. tereticornis* very commonly occur together, as

also do *E. saligna*, *E. punctata*, *E. acmenioides*, *E. paniculata*, and *E. pilularis*. In addition, *E. corymbosa* and *E. haemastoma* are generally met in company. The physical conditions suiting one member of the group, suit the others.

The Parramatta District may be briefly described as a huge natural amphitheatre, with the town lying rather low in the centre, at a level of 50 to 100 feet above the sea; and the Parramatta River running west to east, dividing it into a northern and southern half. The latter is covered by a deep, heavy Wianamatta clay-shale formation, much of it rather low-lying and fairly level, but gradually rising to a height of about 150 feet. This country has a fair rainfall, but the soil is not very fertile, in places being almost barren, though, with careful cultivation, grapes and peaches grow well. It is also suited to rose-growing, but citrus fruits do badly. To the west of the town, we still have the Wianamatta clay, but the atmosphere is much drier, the rainfall less, it gets less of the sea-breezes, and is exposed to the hot dry westerlies in summer, and to very severe frosts in winter. On the northern side, the land rises to a much greater height, 500-550 feet at Galston, and is mainly composed of Hawkesbury sandstone or a thin stratum of Wianamatta clay-shale overlying this, while deep gullies erode it, and give free drainage. This part is the home of citrus fruit, the growing of which has always been the main Parramatta industry. Through the district are also a number of volcanic dykes and necks, the best known of which are those at Dundas and Prospect. The soil overlying these is richer in quality, but is not deep enough nor extensive enough to have any influence on the character of the flora.

Let us now consider, in detail, the various Eucalypts and their distribution. In the rather flat, deep-clay country around Rookwood, Granville, and Auburn, in the south-eastern quadrant, where there is much ironstone-gravel in the clay, we mostly find *E. siderophloia* (Broad-leaved Ironbark), *E. longifolia* (Woollybutt), and *E. resinifera* (Red Mahogany); while, on the higher ground, one meets a good proportion of *E. tereticornis* (Red Gum), *E. eugenioides* (White Stringybark), and *E. hemiphloia* (Yellow Box).

The most shapely of the above Eucalypts will almost invariably be found to be *E. resinifera*. Growing on the deep clay, this tree is of slower growth, and good spreading habit; and, with its fairly broad dark green leaves, it throws a most agreeable shade. As it is very hardy, and will grow in almost any soil, clayey and sandy alike, it is a pity it is not more extensively planted for ornamental purposes and as a breakwind. The timber is also of value commercially. Near Rookwood, a few *E. hemastoma* (Scribbly Gum) may be seen on poor clay soil, which probably is not very deep. As one proceeds westwards along the deep clay-formation, the proportion of *E. tereticornis* and *E. hemiphloia* increases, and this is the well-known type-locality of the latter. More *E. eugenioides*, too, is seen, and around Fairfield, Westmead, and Merrylands, *E. crebra* (Narrow-leaved Ironbark) makes its appearance, the atmosphere here, on account of the absence of sea-breezes, being drier and hotter in summer. At Fairfield and Cabramatta, a few specimens of *E. paniculata* (White Ironbark) occur, while *E. siderophloia* is very plentiful. Dr. Woolls has recorded *E. sideroxylon* (Red-flowering Ironbark) as growing in this neighbourhood, but it seems to be very scarce, having been almost cut out by timber-getters. The most remarkable instance of localisation of a species is that of *E. maculata* (Spotted Gum). This, one comes on quite suddenly at Smithfield, extending in a westerly and southerly direction, where it forms the bulk of the forest vegetation, being associated mainly with *E. eugenioides* and *E. siderophloia*. Moreover, the soil on which it occurs, does not seem to differ materially from that around, being a stiff clay with much ironstone therein. Mr. R. H. Cabbage has recorded *E. maculata* between Camden and Burragorang, and it also occurs at Gosford, Clyde River, and other parts of the coast of New South Wales, apparently in the same patchy way. There must be some particular conditions of environment that are always requisite for its growth, but exactly what these are, it is hard to say. Around Cabramatta, Woolls has recorded *E. Bosistoana*, and Mr. J. H. Maiden has recently described *E. Boormani* as occurring. With regard to *E. capitellata* (Brown Stringybark), which Woolls has recorded for Par-

ramatta, I have failed to find it here. As it grows on the Hawkesbury sandstone around Sydney, and at Cronulla and National Park, he may have found it on some of the sandstone-formations hereabout, or he may have classified some of the larger-fruited forms of *E. eugenoides* as *E. capitellata*. Leaving Fairfield, and working in a north-westerly direction to Prospect, Blacktown, and Seven Hills, the three commonest Eucalypts are still *E. hemiphloia*, *E. tereticornis*, and *E. crebra*, with a proportion of *E. eugenoides*, *E. longifolia*, and *E. siderophloia*. At Blacktown, I found a tree of *E. Bosistoana* (Ribbon or Bastard Box) growing alongside a creek.

Coming now to the northern side of the Parramatta River, the home of the citrus fruit-growing industry of Australia, one cannot fail to be struck with the immediate change in the varieties of Eucalypts growing there. Instead of the deep clay of the southern part, we have outcrops of Hawkesbury sandstone, and, even where the clay exists, it is mostly a thin layer, through which the roots penetrate to the sandstone. Around Rydalmere and Dundas, where the sandstone is bare, we find mostly *E. resinifera*, *E. corymbosa* (Bloodwood), and *E. hæmastoma*. *E. pilularis* (Blackbutt) also grows to magnificent proportions, except on the tops of the ridges. Where the sandstone is overlaid by the clay-shale, we find the following species:—*E. pilularis*, *E. punctata* (Grey Gum), *E. acmenioides* (White Mahogany), *E. resinifera*, *E. paniculata* (White Ironbark), and *E. saligna* (Sydney Blue Gum). Throughout Ermington, Dundas, Eastwood, Pennant Hills, Carlingford, and Dural, these are the prevailing trees. Where the clay is a little deeper, *E. eugenoides* and *E. siderophloia* appear; and where it is deeper still, as along the Carlingford Road, *E. tereticornis* also is in evidence, but without its usual companion, *E. hemiphloia*. At North Rocks, on the sandstone ridge, the Sydney Peppermint, *E. piperita*, is frequent, while along the creek near the Rydalmere Asylum dairy, a clump of *E. robusta* (Swamp Mahogany) is growing. At Eastwood, Mr. Baker has recorded *E. umbra* (Bastard White Mahog-

any). On the highest hills about Dural and Galston, at an elevation of 400-600 feet, I have frequently come across *E. eximia* (Yellow Bloodwood). This is a Blue Mountain species, and I do not think it is generally known that it comes so close to the coast.

Finally, when we come to the north-western quadrant, around Baulkham Hills and Kellyville, the sandstone gives place to the deep clay-shale formation, and we have a corresponding change in the Eucalypts; and we find *E. hemiphloia*, *E. tereticornis*, *E. crebra*, with a lesser proportion of *E. eugenioides* and *E. siderophloia*.

I should like to add a few words on the flowering periods of the Eucalypts above considered. This is a subject which merits greater consideration than it has so far received. Many Eucalypts flower regularly at the same period every year, others bloom irregularly; and when rain follows a dry spell, they make fresh growth, which soon forms buds, which later on come into flower. Such is the case with *E. eugenioides*, different specimens of which may be seen in bloom over the greater part of the year, though the main body of bloom comes out in May. With other species again, if the season is dry and unfavourable, the flowering may be slight or missed altogether, or it may be a month or two late. Again, a profuse blossoming after a good season or after a rest, is usually followed by a scanty one the next season. *E. tereticornis* and *E. paniculata* are winter and spring bloomers, and flower regularly from June to October, coming in earlier in some years than others. *E. robusta* is very regular, and lasts from June to the end of July. *E. Bosistoana* comes in August, while *E. crebra* corresponds to *E. paniculata*, viz., June to October. The species which bloom in midsummer are *E. resinifera* (December), *E. siderophloia* (January), and *E. saligna*, *E. piperita*, *E. acmenioides*, and *E. pilularis* in January and February. In the autumn, *E. hæmastoma*, *E. punctata*, and *E. hemiphloia* flower in February and March, while *E. longifolia* and *E. corymbosa* come out in March

and April. *E. globulus*, cultivated, flowers generally in June and July, and *E. citriodora*, cultivated, in June. The latter grows exceedingly well, better than about Sydney, though the frosts may cut it up when young.

Though the Eucalypts, what with one species and another, may be found in flower every month of the year, yet their near relatives, the Angophoras, all bloom in the summer about the same time. *A. lanceolata* leads off early in December, then come *A. intermedia* and *A. subvelutina* in the middle of that month, and lastly *A. cordifolia* early in January.

In considering the question of hybridisation between Eucalypts, full consideration should always be given to the time of the year at which they flower. Thus, crossing of *E. robusta*, which blooms in winter, with *E. hemiphloia*, which is out in summer, would be impossible, though there is a chance of such crossing occurring between *E. tereticornis* and *E. paniculata*, or *E. saligna* and *E. acmenioides*. But the mere fact of two species growing together and flowering at the same time, yet maintaining constant and specific characteristics over a great range, points to the conclusion that hybridisation is most unlikely or impossible between them. In fact, I think the law may be laid down, that natural hybridisation is unlikely to occur between two species growing freely together and flowering at the same time. The mere fact of these species keeping pure, favours this view. Experience with the Acacias bears out this. These, in the majority of instances, flower in the early spring, and mostly at the same time; yet the species keep distinct. The most reliable instances of hybridisation of Acacias, so far recorded, are those between *A. Baileyana* and *A. decurrens*, *A. dealbata* and *A. podalyriæfolia*, and *A. pycnantha* and *A. podalyriæfolia*, the parents in each case occurring in widely separated localities. If I were attempting to hybridise Eucalypts, I should expect greater chances of success from two species growing widely apart, as say from Western and Eastern Aus-

tralia, than from two growing together and blooming simultaneously.

In addition to the Eucalypts already mentioned, there are several other species growing in adjacent localities, and which may occur in the Parramatta area, but I have so far failed to come across them. Such are *E. squamosa* (Ironwood) found at Cabramatta, Wahroonga, and Richmond, and so almost sure to be also in the area under review; and others possibly present, are *E. nigra* R. T. Baker, *E. patentinervis* R. T. Baker, and *E. Fletcheri* R. T. Baker.\*

#### CLASSIFICATION.

*Eucalypts growing mainly on sandstone (Hawkesbury).*

<i>E. corymbosa.</i>	<i>E. hæmastoma.</i>
<i>E. eximia.</i>	<i>E. squamosa.</i>

*E. piperita.*

*Eucalypts growing mainly on deep clay (Wianamatta).*

<i>E. crebra.</i>	<i>E. maculata.</i>
<i>E. sideroxylon.</i>	<i>E. longifolia.</i>
<i>E. siderophloia.</i>	<i>E. Boormani.</i>
<i>E. hemiphloia.</i>	<i>E. tereticornis.</i>
<i>E. Bosistoana.</i>	<i>E. Parramattensis, sp. nov.</i>

*Eucalypts mainly growing on clay (thin layer) overlying sandstone,*

<i>E. paniculata.</i>	<i>E. acmenioides.</i>
<i>E. umbra.</i>	<i>E. saligna.</i>
<i>E. pilularis.</i>	<i>E. punctata.</i>

*Eucalypts occurring on all formations.*

<i>E. eugenoides.</i>	<i>E. resinifera.</i>
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*Eucalypt growing in swampy ground.*

*E. robusta.*

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\* Mr. Fletcher informs me that, some years ago, a few trees of *E. Baueri* (to which species Mr. Maiden refers the specimens recorded, under the name of *E. polyanthemos*, in the Fl. Austr., as collected at George's River, by Robert Brown) were to be found on the north bank of the creek, a little west of Lansdown Bridge on the Liverpool Road.

## EUCALYPTUS PARRAMATTENSIS, sp. nov.

\* Arbor mediocris, lævis, 15-30 ped., ramulis angulatis, teretibusve pendulis; foliis heterophyllaceis, primis vel juvenilibus in petiolum contractis, alternis, 7"-9" longis,  $1\frac{1}{2}$ " latis, lanceolatis, falcatis; secundis vel maturis alternis, petiolatis, lanceolatis, nonnunquam falcatis, 5"-6" longis, concoloribus, subcoriaceis, nonnunquam nitidulis; venis prominulis, vena media pallida, venis lateralibus nonnihil obliquis, patule ascendentibus, reticulatis, ante marginem unitis, vena peripherica a margine nonnihil remota; glandulis oleosis numerosis; pedunculis axillaribus, 4'''-6''' longis, 4-7 floris; floribus pedicellatis, operculo hemisphærico, nonnunquam breviter acuminato, 3'''-4''' longo, calycis tubo circa 2''' longo; fructu hemisphærico, 3''' lato, margine rotundo, valvis exsertis.

A medium-sized tree, 15-30 feet high, as far as seen; branchlets angled or round, drooping, giving the tree a light graceful appearance; stem 2-2½ feet in diameter. Found growing in a flat low-lying situation, on poor clay soil, in company with *E. hæmastoma*.

*Hab.*—Fairfield, Cabramatta, Auburn (C. Hall), Milton (R. T. Baker), all in New South Wales.

*Bark* smooth, whitish or greyish, stripping off in flakes in the autumn, intermediate between the barks of *E. hæmastoma* and *E. punctata*, but without the insect-markings of the former.

*Leaves* heterophyllaceous.

*Seedling leaves.*—Cotyledons very small, obtusely triangular, sometimes slightly emarginate; first pairs of leaves linear or narrow-lanceolate, obtuse, opposite, decussate, petiolate.

Primary or juvenile leaves large, up to 7 or 9 inches long and over an inch broad, petiolate, lanceolate, falcate. Secondary or mature leaves lanceolate, sometimes falcate, but smaller than the primary leaves, a uniform dark green colour on both sides, subcoriaceous sometimes shining; venation moderately well-marked, the reticulations giving a roughish surface; lateral veins oblique, fairly distant, and having a looping arrangement with the marginal vein, which is clearly defined and fairly removed from the edge; oil-glands numerous.



*Peduncles* axillary, 4-6 lines long, bearing few flowers, 4-7.

*Buds* on a short pedicel,  $1\frac{1}{2}$ -2 lines long; calyx-tube  $1\frac{1}{2}$ " long; operculum hemispherical and domed or conical and shortly acuminate, much longer than calyx-tube.

*Fruit* hemispherical, 3 lines in diameter, rim rounded to the dome of the ovary or base of valves, which are free from the rim and often recurved.

*Timber*.—A pale pink-coloured wood, of little economic value, as far as seen; it is soft, seasons badly, and is attacked by borers in the young trees, so far as known. Perhaps now that the species is differentiated, more favourable specimens may be discovered.

*Oil*.—Mr. H. G. Smith reports that the yield of oil from this species was 0.57 per cent., steam-distilled from material collected as for commercial oil-distillation. The crude oil was but little coloured, and had an odour resembling that of the better crude oils of the Eucalyptol-pinene class. The oil consisted principally of Eucalyptol; the terpene was dextro-rotatory pinene and phellandrene was quite absent. The specific gravity at 15°C. was 0.9223; rotation  $\alpha_D + 2.7^\circ$ ; refractive index at 18°C. = 1.46291. It was soluble in 1.2 volumes 70 per cent. alcohol. The saponification number for the free acid and ester was 4.6, representing only a small amount of ester. The usual volatile aldehydes occurring in these oils were detected. The amount of Eucalyptol in the crude oil, determined by the resorcinol method, was 78 per cent. The essential oil from this Eucalypt is one of the best of the Eucalyptol class, but, unfortunately, the yield is too small to allow the species to be worked commercially.

*Remarks*.—This species has evidently been confused with *E. tereticornis*, a tree common in the neighbourhood in which it grows. The fruits of this tree are quite distinct from those of *E. tereticornis* and its varieties, for the rim, instead of being domed, is rounded like the edge of a pudding-basin, a feature that characterises it from any other species (*vide* Plate lx., fig. 5). The hemispherical fruits might suggest *E. resinifera*, but the bark is smooth, and the timber quite distinct from that of this species, as is also the oil.

The buds are not unlike those of *E. squamosa* Deane and Maiden, but that is the only resemblance to this species.

From var. *lanceolata* R. T. Baker and H. G. Smith, of *E. tereticornis* (syn. *E. Seeana* Maiden), it differs in the shape of the fruits, timber, and primary leaves.

From *E. dealbata*, it differs in having the secondary or mature leaves much darker in colour, and the intramarginal vein closer to the edge; the pedicels are longer, and the rim of the fruit rounded instead of truncate; the primary or juvenile leaves, too, are quite different from the glaucous ovate-lanceolate ones of *E. dealbata*, the timber of which is also more open in the grain, and of even less value.

With regard to the classification of the leaves, I have preferred to describe them under three headings, viz., *seedling leaves*, including the cotyledons and the first 8 or 10 pairs following them; *primary or juvenile leaves*, including those we usually find in the young tree, on true suckers springing from the roots and base of the stem, on shoots springing from the butt of the trunk or branch when the tree has been cut down or a branch has been lopped, and on adventitious shoots springing from the trunk and larger branches; and lastly, *secondary or mature leaves*, those which occur on the mature tree. In this way, we can best characterise the heterophylly which is so typical of the Eucalypts. The terms primary or juvenile seem, to me, preferable to horizontal, sucker, or abnormal as applied to the "young state" foliage. Horizontal, used much by continental writers, especially in describing *E. globulus*, is quite wrong, because, when the young leaves are petiolated, they, in most cases, very early tend to assume the vertical position. The term abnormal, too, is scarcely suitable. The milk dentition of children is, in some respects, comparable, and one would hardly call this the abnormal dentition. The term "sucker," too, applies to one condition in which these leaves occur, but omits the others.

In conclusion, I have to record my grateful thanks to Mr. R. T. Baker for his excellent drawing delineating this species, and his valuable help to me in differentiating and describing it; also to Mr. H. G. Smith, for his report on the oil.

EXPLANATION OF PLATES LX.-LXI.

Plate lx.

*Eucalyptus Parramattensis*, n.sp.      •

Fig.1.—Seedling.

Fig.2.—Primary or juvenile leaves.

Fig.3.—Twig in bud and secondary or mature leaves.

Fig.4.—Twig, with fruit.

Fig.5.—Section of fruit [enlarged].

Plate lxi.

Map of Parramatta District, showing distribution of the Eucalypts.